COMMAND AND CONTROL VEHICLE (C2V)

Army ACAT III Program

Total Number of Systems:	102
Total Program Cost (TY$):	$499M
Average Unit Cost (TY$):	$4.9M
Full-rate production:	1QFY00

Prime Contractor

United Defense, LP; Rosslyn, VA

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The Command and Control Vehicle (C2V) is designed to provide a highly mobile, survivable, and reconfigurable platform capable of hosting current and future command, control, communications, computer, and intelligence (C4I) systems for operational planning. C2V will be used by battalion through corps battle staffs in heavy force operations. It will directly support the ***Joint Vision 2010*** concept of ***information superiority*** for battalion through corps leaders, with a resulting improvement in the employment of a ***dominant maneuver*** force.

C2V is an armored, tracked command post vehicle that will house and transport C4I equipment on the battlefield with workspace for six staff officers–four at workstations and two in jump seats–plus a two-man crew. C2V will enable command and control mission functions during mobile operations by allowing command post platforms to be positioned at critical locations throughout the battlefield. This system will selectively replace the basic M577 Carrier, Command Post Light, and its M1068 upgrade, which are both considered to have inadequate power, speed, mobility, survivability, and internal

operating space. C2V armored-mission module is mounted on a modified M993 Multiple Launch Rocket System chassis, which is powered by the 600-horsepower drive-train used by the M2A2 Bradley Fighting Vehicle from the FBCB2 program.

BACKGROUND INFORMATION

The program has two material developers: Program Executive Officer for Command, Control, and Communications Systems, responsible for the hardware and software for the computer workstations in the vehicle; and the Program Executive Officer for Ground Combat and Support Systems, responsible for the vehicle and local area network wiring.

The C2V program is under DOT&E oversight for both OT&E and LFT&E. The C2V TEMP was approved in October 1993 and updated in March 1994 following a December 1993 Milestone II. The LFT&E strategy was approved in July 1996, but contained an open issue regarding the applicability of the explosively formed penetrator as a threat munition to the system. The issue was resolved in FY98, and an explosively formed penetrator threat was included in the full-up, system-level Live Fire Test conducted during FY99-00.

In early FY99, the Program Manager decided to modify the armor composition of the mission module used in the prototypes and LRIP I vehicles. For LRIP II and beyond, the sidewalls of the module will be made from monolithic aluminum armor rather than the aluminum/Kevlar combination initially used. The Program Manager provided an LRIP II system for the full-up, system-level Live Fire Test.

C2V participated as an initiative during the 1997 Task Force XXI Advanced Warfighting Experiment. It was observed that the C2V provides greater mobility and protection than predecessor systems, and with more interior room, allows for better staff coordination when the staff must operate within the command vehicle. The larger size and array of antennas also make C2V an attractive target for enemy direct-fire or close-air support systems. While conducting missions on the move (approximately 5 percent of the time for the Advanced Warfighting Experiment), operators were able to share information within the vehicle, but inter-vehicle communications were planned to be not functional. There were also a number of observations that indicated that motion sickness might be a serious problem with the configuration tested. Configuration testing was conducted in 1998 on three C2V variants to examine the effect on crew motion sickness. There was no difference in frequency of motion sickness detected between the variants. Based on these results, there were no changes in the internal vehicle configuration; however, the incidence of motion sickness and the potential impact on soldier performance remain an issue for future operational testing.

TEST & EVALUATION ACTIVITY

In FY99, the principal LFT&E activity was the full-up, system-level Live Fire Test on a complete C2V system, including all on-board communications and computers. The system was subjected to five near-miss artillery detonations, impacts on the roof by two dual-purpose improved conventional munitions, and one explosively formed penetrator and one scatterable anti-tank blast mine under a track. The nine test events were executed as planned, and operational checks and damage assessments were conducted immediately after each test event. Army soldiers were on hand to perform troop-level battle damage assessment and repair. In addition, plans were formulated for firing artillery fragment simulator projectiles at two types of weld seams to assess penetration resistance at joints. The test firings will be conducted in early FY00.

Other activities included efforts to finalize plans for IOT&E, which will now be conducted in conjunction with the Force XXI Battle Command, Brigade and Below Limited User Test in 3QFY00.

TEST & EVALUATION ASSESSMENT

Although the Live-Fire Assessment is not complete, the full-up, system-level Live Fire Test did not reveal any major vulnerability in the design of the C2V's mission module. The chassis, however, affords less ballistic protection than the mission module, and some vulnerability flaws were found during testing.

IOT&E remains to be conducted (FY00); however, based on testing and experimentation, we believe C2V has the potential to provide a more mobile and integrated command-and-control vehicle for the combined arms force. We have noted two concerns that could preclude the Army's readiness for IOT&E:

- *First* is the issue of co-site electromagnetic interference due to close proximity of the many systems and antennas necessary for command, control, and communication. This may occur within a single C2V or between multiple C2Vs in a Tactical Operations Center (TOC). Co-site interference between systems causes desensitization, and for every 10 decibels of desensitization the effective communication range is reduced by approximately one-half. During recent co-site testing on a Marine Corps vehicle of similar configuration, desensitization of up to 66 decibels was observed. C2V developers are pursuing ways to mitigate co-site problems. This issue must be resolved, or at least adequately characterized, prior to the execution of IOT&E.

- *Second* is the issue of TOC configuration and movement plans within the test unit (4th Infantry Division). As noted in the system description, C2V is intended to provide enhanced command and control, increased mobility with greater speed, and improved survivability via movement and dispersion. The 4th Infantry Division's TOC employment concept has evolved during their Force XXI experimentation the past several years. To some extent the evolution is a result of the many experimental systems inadequately ruggedized for the rigors of the tactical environment and associated movement. The Division's concept is to operate primarily out of Command Information Center tents, and includes only limited movement of TOCs, minimal dispersion of TOC assets, and minimal on-the-move operations. We expect this concept to result in decreased survivability in those threat environments where C2V is employed and degraded communications due to co-site interference problems. Furthermore, the non-doctrinal employment of C2V in IOT&E would result in an inadequate test of whether C2V has met the requirements for which it was designed. We also expect the Army to resolve this issue prior to the execution of IOT&E.

CONCLUSIONS, RECOMMENDATIONS, LESSONS LEARNED

As a result of LFT&E efforts, the C2V mission module has: (1) thicker monolithic armor instead of the original thinner armor with a ballistic liner; (2) more robust latches for doors and hatches using the Abrams tank hatch design; (3) increased protection around the rear door of the mission module; and (4) better mounting fasteners and inserts for the primary power-unit panel.